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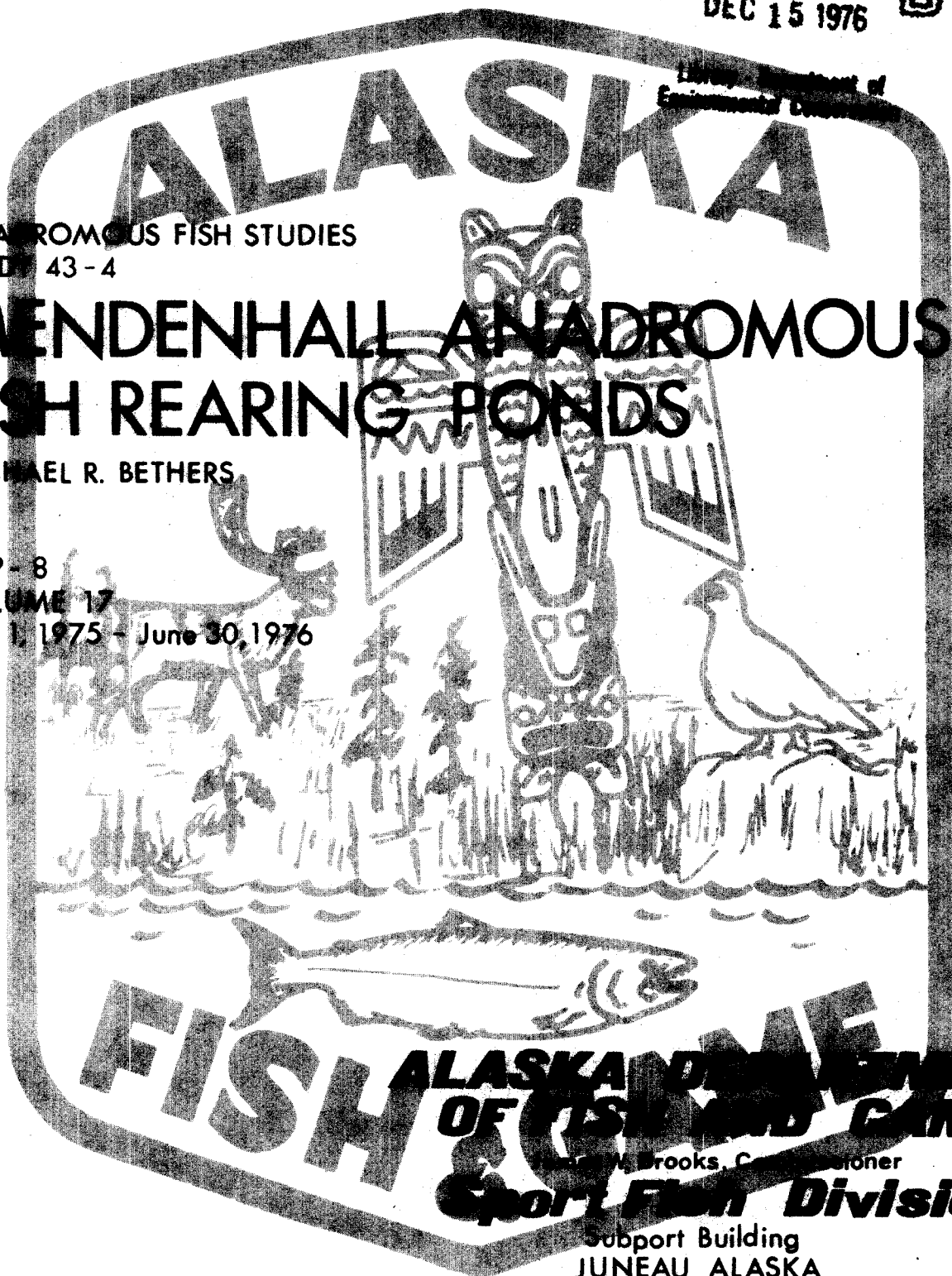
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ANADROMOUS FISH STUDIES  
STUDY 43-4

# MENDENHALL ANADROMOUS FISH REARING PONDS

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VOLUME 17  
July 1, 1975 - June 30, 1976



ALASKA DEPARTMENT  
OF FISH AND GAME

HARRY W. BROOKS, Commissioner

Sport Fish Division

Support Building  
JUNEAU, ALASKA

STATE OF ALASKA

*Jay S. Hammond, Governor*



Annual Performance Report for

MENDENHALL ANADROMOUS  
FISH REARING PONDS

by

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## RESEARCH PROJECT SEGMENT

State:	ALASKA	Name:	Sport Fish Investigations of Alaska
Study No.:	AFS-43	Study Title:	MENDENHALL ANADROMOUS FISH REARING PONDS
Job No.:	AFS-43-4	Job Title:	<u>Pond Rearing of King and Coho Salmon</u>

Period Covered: July 1, 1975 to June 30, 1976.

## ABSTRACT

A total of 3,904, 1973 brood coho salmon, Oncorhynchus kisutch (Walbaum), smolts were released from 209,485 fry planted in Moose Lake September 16, 1974. Survival from planting to removal of the 1973 brood coho in Moose Lake was 4.9%.

Moose Lake was restocked on June 24, 1975 with 134,500, 1974 brood coho fry. One of two rearing pens within Moose Lake received 5,000 fry and one received 10,000 fry. All fish were 300 per pound (660/kg) at planting and on October 16, 1975 were found to be 36 per pound (79.2/kg), 46 (101.2/kg) per pound, and 49 per pound (107.8/kg) in Moose Lake and the two rearing pens respectively.

An estimated 8,008 adult coho from 1972 brood Mendenhall-reared smolts returned to the Juneau area in 1975. An estimated 322 adult coho from Mendenhall-reared smolts were taken in the local saltwater sport fishery. This constituted 5.9% of the local saltwater sport catch of coho. From projections based on Adipose-clip marked fish, Mendenhall-produced coho were taken in the commercial troll fishery. An estimated escapement of 6,770 adults returned to the facility or spawned naturally in the Mendenhall River. A total of 555 coho were spawned, and yielded approximately 1,100,000 eggs for hatchery incubation and future stocking.

The coho jack return from 1973 brood smolts that were released in 1975 was 729 fish, including 27 jacks taken in the local sport fishery.

Data on growth and pathology of rearing fish, jack and adult coho catch and escapement, and adult coho movements are presented in this report.

## BACKGROUND

Rearing fish were first stocked at the Mendenhall Lakes Rearing Facility on August 7, 1973. Initially, the three lakes to be used for rearing were connected by channels, and had a common outlet. Norton and Dredge lakes were stocked with coho salmon, and Moose Lake was stocked with spring chinook salmon, O. tshawytscha (Walbaum), fry. During the first rearing cycle many engineering problems were experienced throughout the rearing facility. Because of this, considerable numbers of rearing fish were lost. Even so, a total of 93,129 chinook smolts and 81,425 coho smolts were successfully released in the spring of 1974.

Because of engineering problems, it was considered not feasible to restock Norton and Dredge lakes in 1974. Moose Lake was restocked with coho in September, 1974, and a mortality rate of 95% through the rearing cycle occurred. In June 1975 Moose Lake was restocked with coho fry. During 1975 adequate manpower was available to properly maintain and sample rearing fish and to rebuild inadequate weirs and dikes at the facility. After this construction the facility assumed the finished appearance and high degree of serviceability it lacked during the first two years of operation.

During the summer of 1975 the first adult coho returning from Mendenhall-produced smolts were taken in the local sport and commercial fisheries. These fish varified the project's contribution to the fishery resources of the community. Photographers and bird enthusiasts became frequent visitors at the facility. Students have used the rearing facility as an outdoor classroom annually since the beginning of the project. Both fishermen and nonfishermen in the Juneau area have benefited from the project.

## RECOMMENDATIONS

1. Rearing fish of different origins should be kept separate to isolate different gene pools. By isolation of genetically different stock, studies of survival, time of spawning, and productivity could be made to select the stock of fish best adapted for rearing in Mendenhall Lakes.
2. The feasibility of retaining one-year-old nonsmolt coho for transfer to estuarine rearing pens for additional rearing should be determined.
3. The feasibility of pond-rearing coho fry during the summer and then transferring then to local estuarine rearing pens for overwintering and additional feeding should be determined.
4. Statistically valid procedures should be developed and employed in sampling rearing fish populations, catch, and escapement.
5. The feasibility of releasing estuarine-reared smolts into freshwater for imprinting and out-migration should be determined.

6. The project goal of experimental rearing of salmon smolts should be continued through routine maintenance, monitoring, and logistics programs as has been done throughout the past year.
7. Feeding of medicated food, should be done periodically to increase fish resistance to stress.
8. Coded wire tags in conjunction with adipose finclips should be used to mark fish released from Mendenhall Lakes. Such marking should be part of a comprehensive evaluation plan for return to the local fishery.
9. Develop techniques which maximize operation efficiency and minimize fish handling at the facility.

#### OBJECTIVES

1. Determine feasibility of increasing the numbers of king and coho salmon available to the saltwater sport fishery in the Juneau area by pond rearing of salmon from fry to smolt.
2. Determine feasibility of improving smolt production by rearing salmon from fry to smolt in pens within Moose Lake.
3. Determine feasibility of retaining one-year-old nonsmolt coho for an additional year of rearing and release as two-year-old smolt.
4. Establish a reliable source of Mendenhall stock king and coho salmon eggs for future use at the rearing facility.

#### TECHNIQUES USED

The 1973 brood coho in Moose Lake were fed dry pellet feed until freeze-up on November 29, 1974. Fish were fed Oregon moist pellets with 4.5 gms oxytetracycline per 100 lbs. (45.36 kg) for a two-week period prior to freeze-up and from spring break-up until the out-migration period. All food was broadcast by hand from a 12-foot aluminum skiff as it was rowed around the lake. Records of the amount of feed used were recorded daily.

A diesel-powered 5,000-gallon-per-minute pump was used to lower the water level of Moose Lake and to isolate the fish so that all fish could be removed by seining. The pump was set up on May 6, 1975, and operated continuously until May 10, when the water level was low enough to allow efficient seining. Rearing fish were removed from Moose Lake on May 10, 1975. A 200-foot (90.7 m) long x 15-foot (4.57 m) x 1/4-inch (6.80 cm) mesh purse seine was used to remove fish from the lake. Fish were transported from seine pursing locations at Moose Lake in a 400-gallon, (1.514 liter) aerated live box in the bed of a pickup truck to the holding pond for release. Fish released were enumerated by weighing

every bucket of fish released, then counting every third bucket at release. The number of fish per pound was determined by dividing the number of fish into the pounds of fish. Total number released was determined by multiplying the number per pound by the total pounds of fish released. Prior to release, the right ventral fin was clipped from a percentage of the coho smolts reared in Moose Lake.

A total of 96,679, 1973 brood coho smolts raised at Crystal Lake Hatchery, were released in the holding pond at the Mendenhall facility for imprinting and out-migration. Of these fish, 46,479 were adipose and half-dorsal finclipped, 15,200 were adipose finclipped and coded wire tagged, and 35,000 were not marked. The hatchery-reared smolts were held in the holding pond for five to seven days before being released for out-migration.

Moose Lake was restocked on June 24, 1975 with 134,500, 1974 brood coho which averaged 300 per pound (660/kg). Two 20-foot (6.1 m) x 20-foot (6.1 m) x 8-foot (2.44 m) deep x 3/16-inch (.48 cm) knotless mesh rearing pens were suspended from a floating framework in Moose Lake to test the feasibility of freshwater pen rearing. One rearing pen was stocked with 5,000 fry and one with 10,000 fry.

The 1974 brood coho in Moose Lake and the rearing pens were fed dry pellet feed daily except for a two-week period prior to freeze-up when medicated Oregon moist pellets were used. The fish in Moose Lake and the rearing pens were fed a minimum of three times daily between 0800 and 1650 hours. The amount of feed used on a given day was determined by the fishes' acceptance of food on that day. During each feeding, fish were fed until the feeding response had nearly ceased. Simply, the fish were fed as long as they appeared to be hungry; if at first the fish did not respond in a way that appeared hungry, they were not fed. The amount of feed used was recorded daily.

Fish in Moose Lake and the rearing pens were sampled for average length and number per pound bi-weekly beginning July 10, 1975. Fish from all areas of Moose Lake were to be included in the samples. On July 24 a statistic design was applied to the sampling program. Moose Lake was divided into five sampling areas to insure that fish in all areas of the lake were included in the samples. A sample of at least four pounds (1.81 kg) of fish was taken by use of a 30-foot (9.14 m) x 8-foot (2.43 m) deep x 1/4-inch (.64 cm) mesh purse seine from each of the five areas during a sampling day (at least 200 fish weighing at least 20 pounds (9.1 kg) from the entire lake). Two aluminum row boats were used to operate the seine. Fish food was used as chum to congregate the fish so that an adequate number for samples could be encircled by the seine which was pursed from one boat. Data were collected on the shore of Moose Lake close to the location of capture. Fish measured were first anesthetized in buckets with MS-222 and then lengths were taken in centimeters. After weighing or measuring, the fish were kept in a floating live box in Moose Lake for recovery. Fish were released at the location of capture, after the sample had been processed. At least two pounds (.9 kg) each was purse-seined from each of the rearing pens, and the number of fish per pound was determined from each sample. At least 200 fish from each pen were measured to determine average lengths.

A population estimate study was conducted so that population estimates of free-ranging rearing coho in Moose Lake could be made. Both Petersen's and Schnabel's estimates were used.

A 100-foot (30.45 m) x 10-foot (3.05 m) deep x 3/4-inch (1.91 cm) mesh gill net was used in Moose Lake to catch possible predatory 1973 brood coho that migrated downstream from the Moose Lake watershed after 1974 brood coho had been planted.

Arrangements were made with the Alaska Department of Fish and Game Fish Pathology Laboratory in Anchorage, Alaska, to have samples of rearing fish inspected monthly, or whenever a diseased fish was observed. Samples of six fish each were taken from either Moose Lake or pens. The fish were placed in self-sealing plastic bags, packed on ice in an ice chest, and flown to the Fish Pathology Laboratory in Anchorage. Saltwater creel census, described by Schmidt and Robards (1976), and similar data collected through October 5, 1975 by Mendenhall Lakes personnel, was used to evaluate the contribution of Mendenhall Lakes-produced salmon to the Juneau area marine sport fishery.

The Alaska Department of Fish and Game Commercial Fish Division operates a tagged fish recovery program in several canneries and cold storages in Southeast Alaska. The program is designed to determine the contribution of artificially propagated salmon to the Southeast Alaska commercial fishery. Technicians were stationed at the fish processors to inspect fish for finmarks and coded wire tags as they were unloaded from fishing vessels. Data taken at the Pelican Cold Storage were used to estimate the number of Mendenhall-released adipose finclipped coho taken in the commercial fishery.

An in-migrant entrance was placed in the outlet of the holding pond to allow in-migrating salmon access to the holding pond. The trap entrance prevented downstream escape from the holding pond. Fish were confined to the holding pond by concrete weirs and dikes at the two inlets to the holding pond. In-migrant salmon were held in the holding pond for ripening. Egg takes were performed on October 6, 13, and 21, 1975. During each egg take fish were seined from the holding pond with a 300-foot (91.4 m) x 15-foot (4.6 m) deep x 1-inch (2.54 mm) square mesh seine. Adult coho were sorted (depending on the fish sex and ripeness) into four live boxes built into the new weir on the Dredge Lake inlet to the holding pond. The gametes were taken separately and flown to Crystal Lake Hatchery for fertilization, incubation, and hatching.

Spawned adult coho were enumerated before disposal. Average mideye to fork length of spawned carcasses was determined, and scale samples were taken. The ratio of marked to unmarked adult coho was determined. Spawners returning to the facility after the quota of eggs had been reached were removed by seining from the outlet of the pond system. Spawned carcasses and excess adult coho were either sold for bait to Juneau Cold Storage, given to the public or charitable institutions, or left along the outlet to replenish the nutrient cycle.



Jack coho seined from the holding pond during egg takes were collected for finclip observations. Seined Dolly Varden and cutthroat trout, Salmo clarki Richardson, were released into the Dredge Lake outlet.

Rearing fish populations in the lake were maintained through winter by use of aeration systems designed by the Hinde Engineering Company and described by Bethers (1974).

New weirs [16 feet, (4.88 m) long x 4 feet, (1.22 m) deep] with concrete foundations were built at the outlet of Moose Lake and at the Dredge inlet to the holding pond. New gabion-core dikes were built to connect the weirs to high ground on each side of the waterways, and were also built at the Norton inlet and Crystal Lake inlet to Moose Lake. A map of the rearing facility is presented in Figure 1.

## FINDINGS

### 1975 Brood Coho, Mendenhall/Blind Slough Stock

A total of 209,485 coho were planted in Moose Lake on September 16, 1974. Fish planted were of two different sizes (109,500 at 183/lb, 402.6/kg, and 99,985 at 80/lb, 176/kg) and averaged 127 per pound (279/kg) after two days' mixing in the lake. The coho in Moose Lake grew from 127 per pound on September 16 to 73 per pound on October 18. On May 10, 1975 a total of 10,432 coho were removed from Moose Lake. A total of 10,167 were released. Total survival of 1973 brood coho in Moose Lake was 10,167/209,485 or 4.9%. The ratio of smolt produced to fry planted was 3,904/209,485 or 1.8%. A total of 1,294 (33.1%) were finclipped right-ventral before release into the holding pond for out-migration. Possible factors responsible for the poor survival of rearing coho in Moose Lake are discussed later in this report. A summary of all coho releases made at Mendenhall Lakes Rearing Facility is presented in Table 1.

### 1974 Brood Coho, Mendenhall/Blind Slough Stock

#### Planting:

On June 24, 1975, Moose Lake was stocked with 134,500 coho fry. One rearing pen was stocked with 5,000 coho fry and the other with 10,000 coho fry. All fish stocked were 1974 brood, Mendenhall/Blind Slough stock coho which averaged 300 per pound (660/kg) at stocking.

#### Feeding:

Feeding of the 1974 brood coho in Moose Lake and rearing pens began on June 25 and continued until freeze-up on October 16, 1975. The total amount of food fed to the three groups of rearing fish were:

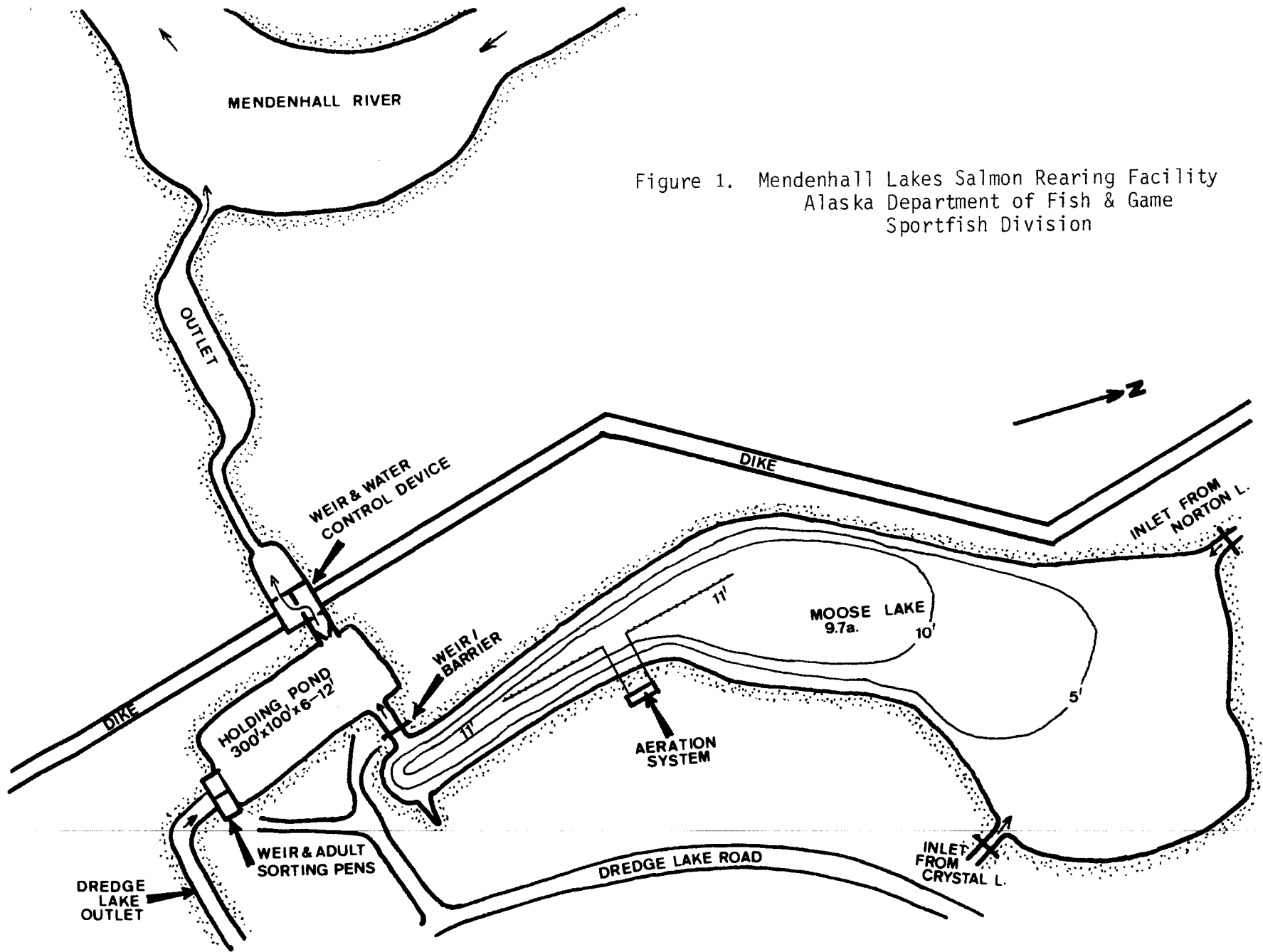


Figure 1. Mendenhall Lakes Salmon Rearing Facility  
Alaska Department of Fish & Game  
Sportfish Division

Table 1. A Summary of Coho Fry Planted and Coho Smolts Released at the Mendenhall Lakes Salmon Rearing Facility.

<u>Brood Year</u>	<u>Stock</u>	<u>Number</u>	<u>Planted Size</u>	<u>Date</u>	<u>Number</u>	<u>Released Size</u>	<u>Date</u>	<u>Number</u>	<u>Percent Marked</u>	<u>Mark</u>
1972	Mendenhall & Blind Slough	271,744	262/1b	8/7/73	81,425	62/1b	4/7/74	24,825	30.5	Ad
1973	Mendenhall & Blind Slough	209,500	127/1b	9/16/74	3,904	73/1b	5/10/75	1,296	33.2	R.V.
	Blind Slough	Smolt imprints from Crystal Lake Hatchery			50,200	14/1b	5/19- 6/6/75	15,200	30.2	Ad & CWT
	Blind Slough	Smolt imprints from Crystal Lake Hatchery			46,479	14/1b	5/19-	46,479	100.0	Ad &
Total					182,008	87,800				
1974	Mendenhall & Blind Slough	A) 134,500	300/1b	6/24/75						
	Mendenhall & Blind Slough	B) 10,000	300/1b							
	Mendenhall & Blind Slough	C) 5,000	300/1b							
	Total	149,500								

	<u>Rangens Dry Pellets</u>	<u>Oregon Mosist Pellets (Medicated)</u>
Moose Lake	6,146 lbs (2,790 kg)	500 lbs (227 kg)
North Pen	609 lbs ( 276 kg)	62 lbs ( 28 kg)
South Pen	<u>342 lbs ( 155 kg)</u>	<u>35 lbs ( 16 kg)</u>
Total	7,097 lbs (3,221 kg)	597 lbs (271 kg)

An experimental feeding was made on January 14, 1976. In both rearing pens an active surface feeding response was stimulated; however, it subsided after two to three minutes. Approximately 1/2 pound (1.1 kg) of feed was used in each pen. No feeding reaction could be stimulated from rearing fish in Moose Lake. The water temperature was 0.8°C.

#### Growth:

Length and weight data were taken on fish in rearing pens and free-ranging fish in Moose Lake so that a comparison of fish production in the pens and in the lake could be made.

October 16 was the last day that fish growth data were collected during 1975. At that time rearing fish were found to be:

	<u>Average Length</u>	<u>Number/Pound</u>
Moose Lake	100.1 mm	36 ( 79.2/kg)
South Pen	90.1 mm	46 (101.2/kg)
North Pen	87.9 mm	49 (107.8/kg)

A comparison of growth of free-ranging fish in Moose Lake and fish confined in rearing pens is presented in Figure 2.

#### Population:

Population estimate data was collected weekly from July 10 through September 11, 1975. The population estimates calculated by both the Petersen and Schnabel methods are presented in Table 2.

#### Pathology:

Periodically, samples were taken and submitted to the Alaska Department of Fish and Game fish pathology laboratory, with the following results:

1. Presence of expected organism such as aeromonas, a bacterium associated with crowding, temperature changes, and other sources of stress.
2. Preliminary samples suggest the possibility of the fish parasite Bothriocephalus, or a relative. Investigations are continuing.

Figure 2. Growth of coho salmon fry contained in Moose Lake and in two rearing pens within Moose Lake from June 23 to October 16, 1975.

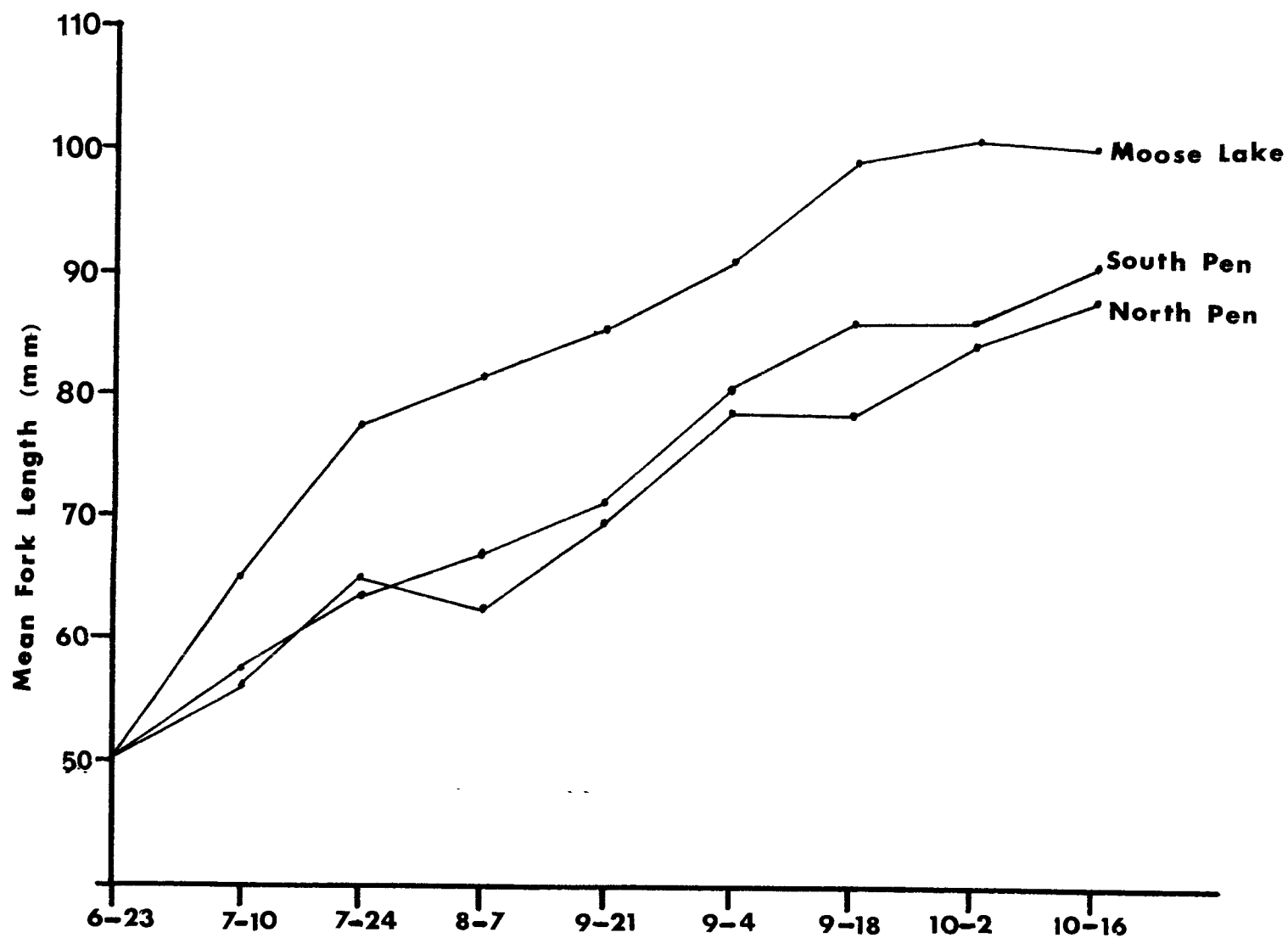


Table 2. Population Estimates

<u>Date</u>	Right Ventral- Upper Caudal Only		Right Ventral- Lower Caudal Only		Left Ventral- Upper Caudal Only		Total Combined Finmark	
	<u>Petersen</u>	<u>Schnabel</u>	<u>Petersen</u>	<u>Schnabel</u>	<u>Petersen</u>	<u>Schnabel</u>	<u>Petersen</u>	<u>Schnabel</u>
7/17/75	10,505	10,505					10,505	10,505
7/24/75	10,403	10,437					10,403	10,437
7/31/75	49,808	13,028					49,808	13,028
8/ 7/75	48,518	17,792					47,249	17,621
8/14/75	91,753	24,144	71,743	71,743			87,306	25,132
8/21/75	48,202	27,454	43,985	49,829			46,659	29,375
8/28/75	78,116	31,559	44,744	47,026			58,649	34,097
9/ 4/75	65,159	34,031	49,729	47,986			56,083	37,129
9/11/75	138,574	37,554	40,230	45,610	40,971	40,971	58,156	39,845

## Return 1972 Brood Coho

### Catch:

A total of 5,430 adult coho were taken in the Juneau area marine sport fishery. The Mendenhall Lakes Salmon Rearing Facility contributed 322/5430 or 5.9% of the coho taken in the local saltwater sport fishery.

Data collected by rearing facility personnel between September 30 and October 5, 1975 are included in this evaluation. The catch distribution of adipose finclipped adult coho taken in the Juneau area sport fishery is presented in Figure 3. Some apparent movements of adipose marked coho recovered in the fishery were determined and are presented in Figure 4.

A total of 11 adipose finmarked adult coho were known to have been taken from the Mendenhall River. This is not an expanded figure, as a valid sampling program was not carried out. A total of 901 adult coho of Mendenhall Lakes origin were taken in the commercial troll fishery. Catch and return data are presented in Table 3.

### Return:

A total of 1,936 adult coho were known to have entered the holding pond between September 9 and October 17, 1975. A total of 386 females and 169 males were spawned. A total of 1,100,000 eggs were taken. Average fecundity was 2,850 eggs per female. On December 20, 1975, the outlet of the facility was found to be full of adult coho. These fish were seined from the outlet, and more adult coho were attracted into the outlet from the Mendenhall River by regulating the outflow of water from the holding pond. In all, a total of 2,338 coho were removed from the outlet during December, 1975.

During January, 1976, 500 adult coho entered the outlet of the facility. These fish were counted in the stream and left for replenishment of the natural nutrient cycle. An estimated 500 adult coho were left in the holding pond where they could not be counted because of an 8-inch ice cover. Surveys along the Mendenhall River from the upper bridge to Mendenhall Lake revealed adipose-clipped coho spawning in the riffles. An estimated 1,500 coho of Mendenhall Ponds origin are believed to have spawned naturally in the Mendenhall River. All coho returns to date are summarized in Table 3.

The average mideye to fork lengths of adult male and female coho, marked and unmarked, returning to the rearing facility in September and October were:

	<u>Number Marked</u>	<u>Adipose Clipped</u>	<u>Length/Sex</u>
Male	589 mm (n= 65)	588 mm (n=34)	589 mm (n= 99)
Female	<u>614 mm (n= 60)</u>	<u>641 mm (n=34)</u>	<u>623 mm (n= 94)</u>
Total	601 mm (n=125)	614 mm (n=68)	605 mm (n=193)

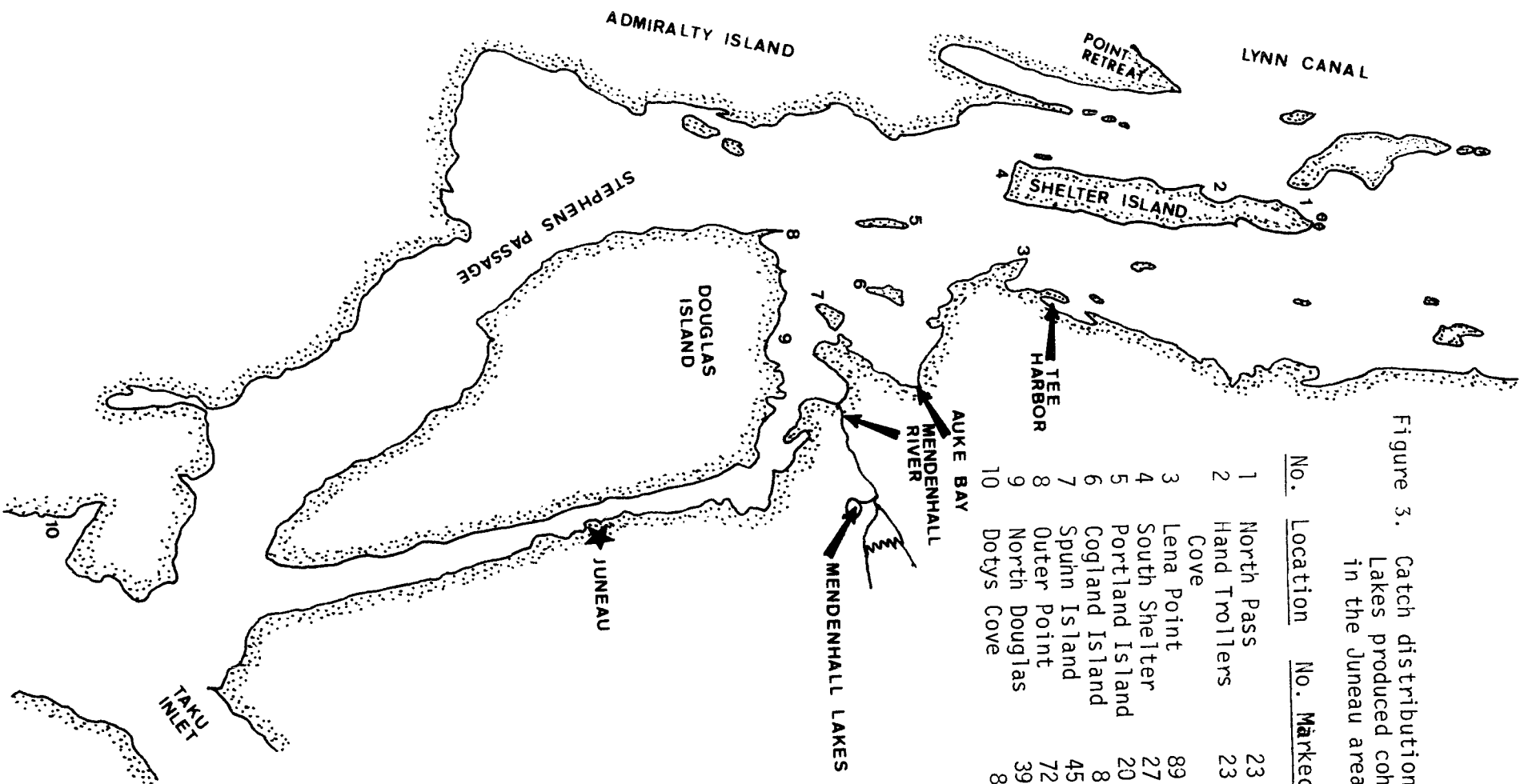


Figure 3. Catch distribution of Mendenhall Lakes produced coho salmon taken in the Juneau area sport fishery.



Figure 4. Locations and catadipose fin-marked salmon taken in the June 1975. Include sport and commercial reports. Arrows indicate movements of marked fish in the area. Circle the numbers of marked fish on the given date.

Table 3. A Summary of Catch and Returns of Coho Salmon Released from the Mendenhall Lakes Salmon Rearing Facility.

Brood Year	Number	Release Size	Percent Marked	Sport Catch		Commercial Catch	Escapement		Total	Percent Marked
				Jack	Adult		Jack	Adult		
1972	81,425	62/1b	30.5 Ad	0	333*	901	614	6,774**	8,622	35.2
1973	3,904	73/1b	33.2	0			2			
	50,200	14/1b	30.2 Ad & CWT	18			576			
	46,479	14/1b	100.0 Ad & 1/2D	9			114			
Total				<u>27</u>			<u>692</u>			

\* Includes 11 fish taken in Mendenhall River and 18 recovered by marine creel census October 1 through October 5, 1975.

\*\* Includes an estimated 1,500 fish which spawned naturally in Mendenhall River.

A total of 2,516 spawned carcasses and adult coho in excess of spawning needs were sold to Juneau Cold Storage in Juneau. A total of 16,487 pounds (7,485 kg) of fish were sold. A total of 759 coho (4,971 pounds, 2,257 kg) in excess of spawning needs were given to the public during "fish giveaways".

### Financing

Funds invested to date at the Mendenhall Lakes Salmon Rearing Facility, exclusive of hatchery costs, have totaled \$295,204 (Table 4).

### DISCUSSION

The low survival of 1973 brood rearing fish in Moose Lake was discussed with Dr. Grischkowsky, Alaska Department of Fish and Game fish pathologist, and Harry Senn, biologist, Washington Department of Fisheries. After discussion with these individuals, it was concluded that the low survival for the 1973 brood year Coho was probably due to a combination of factors which may have included:

1. Rapid changes in water temperature: In November, 1974, water temperature dropped from 45°F to surface ice in 18 days. On April 16, 1975, Moose Lake was partially covered with ice, and water temperature was 34°F; 13 days later the water temperature was 48°F. Rapid temperature fluctuations are known to cause increases in bacteria levels in fish, and perhaps the Moose Lake coho contained some pathogen which was activated by the temperature changes. Cooling and warming of Moose Lake in the winter of 1973-1974 was more gradual than in 1974-1975.

Table 4. Allocations of Monies Invested in Mendenhall Lakes Rearing Facility Through June 30, 1975.

	Total Through 6/30/75	From FY '74-75 Budget	From FY '75-76 Budget	Total to Date
Feed	\$ 4,530	\$ -0-	\$ 4,000	\$ 8,530
Manpower	20,293	18,327	33,366	71,986
Aeration	10,558	-0-	1,200	11,758
Transportation/Milage	548	6,978	6,197	13,723
Rehabilitation	1,113	-0-	-0-	1,113
Construction	80,384	5,628	6,880	92,892
Commodities	5,309	18,025	4,686	28,020
Contract Service	21,048	14,503	1,106	36,657
Other Equipment	28,897	1,628	-0-	30,525
Total	\$172,680	\$65,089	\$57,435	\$295,204

2. Predation: Mr. Harry Senn, of the Washington Department of Fisheries (personal communication May 13, 1975) states that an adult American merganser when fishing undisturbed on a cool-water lake will take up to two-thirds its body weight in fish daily. The poor survival of the 1973 brood year coho may then be partially due to merganser predation. For example, at the feeding rate discussed by Senn, 180,000 coho would last ten mergansers only 90 days. During the last rearing cycle, manpower was not available for bird harassment; therefore, bird predation is considered to have had a significant effect on fish survival. Two birds were collected in February and both contained coho. Those two birds were gaining access to the fish population through open aeration leads in surface ice.

There could have been some predation of the smaller fish (183 per pound) by the larger (80 per pound) fish planted in Moose Lake. This is not believed to be significant, however.

In late June, 1975, sightings of 6- to 8- inch long coho in Moose Lake became common, especially during feedings. The larger coho could be seen chasing and catching rearing fish that were 250 to 300 per pound. It appeared as though the feeding response of the rearing fish stimulated the larger fish. A total of 371 coho from 172 mm to 211 mm were gillnetted from Moose Lake between July 9 and September 16, 1975. The gillnetted fish averaged 188 mm total length and 36 (19.1%) contained at least one rearing fish.

3. Fish: Rearing fish in Moose Lake must spend at least five months under surface ice without artificial feeding. The small 183 per pound fish were possibly too small to have stored enough fat for winter survival without supplemental feeding.
4. Facilities: A total of 2,800 rearing fish are known to have been impeded and killed on the outlet screens during periods of high water. Some rearing fish were known to have escaped from Moose Lake and taken up residence in Norton Lake during the rearing cycle. The number of fish that left Moose Lake was not known. From a gill net fished overnight in Norton Lake, only two 1973 brood coho were taken; on this basis, the number of rearing fish having escaped into Norton Lake is not believed to have been significant.

Moose Lake and the rearing pens were restocked with rearing fish on June 24, 1975. This is the earliest date that rearing fish have been planted at the rearing facility. Fish planted on June 24 averaged 300 per pound and on October 16, 1975 averaged 36 per pound and 100 mm fork length. The fish in the north and south pens achieved average weights and fork lengths of 46/pound and 87.9 mm and 49/pound and 90.1 mm respectively. The difference in growth between fish in the two rearing pens is assumed to be density related. All fish reared in the lake and two rearing pens were fed

according to the fishes' acceptance of food on a given day. Therefore, the greater length and weight achieved by fish reared in Moose Lake is assumed to be due to lower density, as well as the natural food available to the fish in Moose Lake. The fish reared in rearing pens were much more dependent on artificial feeding than those fish reared in Moose Lake.

Winter survival and overall production of fish in the lake and rearing pens is not known at the time of this report. Therefore, a complete evaluation of freshwater rearing pens is not presented. To date, the freshwater rearing pens within Moose Lake have been used through one growing season. Experiences during the one growing season suggest that rearing pens in a shallow lake will experience difficulty resulting from poor water circulation.

The surface temperature of Moose Lake in July and August ranges from 60°F to 65°F, and under these conditions the growth of green filamentous algae on pen nets was found to be extreme. During July and August, the warmest months of the growing season, the buildup of fish waste and waste feed was heavy in the bottoms of the rearing pens. Because of the rapid accumulation of organic "ooze" in the bottom of the pens, warm water temperatures, and the growth of algae on pen nets, the nets were changed every two to four days. Moose Lake is 11 feet deep where the pens were anchored. The pen frames require a draft of .8 feet. Even though clean nets were maintained, the bottom of the pens were in or near the organic benthos of the lake where fish waste and waste food accumulate and decompose. No disease problems were encountered; however, the potential of fish disease epidemics was considered high.

Because of the manpower required (three men per change) to remove fish from a pen and replace the pen net and the excessive handling of fragile rearing fish, the use of rearing pens in Moose Lake is probably not economically feasible using present techniques and physical conditions.

A population estimate was initiated so that estimates of the number of rearing fish in Moose Lake throughout the rearing cycle could be made and time of any significant mortality pinpointed.

Problems were encountered in capturing samples of rearing fish for finmarking during the first three weeks of the study, and data collected were of questionable quality. Sampling problems had not been anticipated, and in reality the first three weeks of the study were spent developing methodology for capturing samples of fish. Soon after finmarks were applied to some fish in the population, it was realized that some areas of Moose Lake were densely populated and others sparsely populated. From mark and recapture data it was apparent that rearing fish in one area of the lake rarely frequented another area of the lake. A month after the study began we found that finmarks applied during the first two weeks of the study were showing much regeneration and that some marks were not recognizable.

In August the majority of rearing fish began to acquire smolt size and characteristics and in the warm water showed increased susceptibility to handling damage.

On September 12, 1975 the population study was terminated because of the excessive handling of fragile rearing fish, the regeneration of finmarks, the nonrandom dispersal of rearing fish in the lake, and problems experienced initially in collecting samples of fish.

A less comprehensive mark and recapture study might be feasible with a single mark and a one-time point estimate of the population (for example, prior to freeze-up).

From data collected under the Catalog and Inventory program, distribution of catch and movements of 1972 brood finmarked adult coho in the Juneau area were plotted (Figure 4). Information on catch distribution may be misleading, because the various fishing areas receive different intensities of fishing pressure, and the largest catches of finmarked coho were from areas receiving the greatest fishing pressure. Had all areas received equal fishing pressure, the catch distribution of finmarked coho may have been different. Sport fishermen naturally tend to fish locations known to be productive rather than to fish over an entire area of unknown productivity.

The catch date and location data plotted in Figure 4, suggest some fish movements in the local area. It appears that finmarked adult coho entered the local area from August 21 to 26, 1965. From the numbers of mark recoveries by location, most fish came around the south end of Shelter Island. From south Shelter Island, some fish headed north across to Lena Point, while others milled in an easterly direction toward the mouth of the Mendenhall River. From August 21 through September 27, mark recoveries were scattered from Point Lena to south Shelter Island, east to Outer Point, and into the estuary of the Mendenhall River. Probably the peak of abundance of these fish, and their greatest availability to the fishery was from August 21 through September 27, 1975. On September 6, the first marked coho was taken from the Mendenhall River estuary (Spuhn Island). Marks continued to be recovered from this area (Spuhn Island and North Douglas) through October 4, 1975. The first adult coho were found in the rearing facility holding pond on September 11, 1975. These adults were small in size, in bright condition, and probably ascended the Mendenhall River during the high tides of September 6 through 9, 1975. Adult marked coho were taken in the Mendenhall River sport fishery from September 28 through October 4, 1975.

No adult coho were known to have entered the rearing facility between October 18 and approximately December 17, 1975. The reason for the two-month break in the in-migration is not known. The interruption in in-migration could be linked to the mixing of Mendenhall and Blind Slough 1972 brood stock; however, a more probable factor was the freezing conditions and subsequent low water experienced from October 18 through mid-December, 1975. It is not known where the later group of in-migrants spent the extra two months. They could have been holding in

deep pools in the Mendenhall River or in the saltwater estuary of the Mendenhall River. The fact that no marked fish were recovered from the river fishery after October 4 and that the later in-migrants displayed very little saprolegnia leads one to believe they were holding in salt water. Adult coho held in fresh water for two to three weeks usually show considerable saprolegnia infection. It should also be noted that if the late in-migrants were holding in the river during the freezing conditions, the near freezing water temperatures could have significantly reduced the fishes' activity and catchability.

A total of 4,274 adult coho returned to the rearing facility and an additional estimated 2,500 were lost in the Mendenhall River and ice-covered holding pond for a total estimated escapement of 6,774 adults.

A total catch of 1,254/8,040 or 15.6% of the adult return was realized. A catch of 7,453/8,008 or 93.0% could have been taken with adequate spawners remaining for brood stock egg-takes.

In 1973 the Catalog and Inventory program determined that a sport-caught salmon taken in the Juneau area saltwater fishery contributed a minimum of \$83 to the local economy. Using this figure, the value of Mendenhall-produced sport-caught coho is approximately \$28,102. Also, the value of artificially-produced coho taken by the commercial troll fleet was approximately \$6,600. Had the total potential catch (7,453) been taken by the sport and commercial fisheries at the same percentages as was actually realized (27% and 73% respectively), the value of the catch would have been:

27.0% sport	= 2,012 fish @ \$167,021.00
73.0% commercial	= 5,440 fish @ <u>39,239.00</u>
Total	\$206,260.00

When one initially compares the \$237,769 invested in rearing the 1972 brood coho to the \$28,102 catch value realized, the economic feasibility of pond-rearing smolts is questionable. However, the \$237,769 invested includes construction costs of the rearing facility, and an investment will rear many brood years of smolts. The annual investment expended on succeeding years of production will be minor compared to the initial investment. With amortized start-up costs the project becomes closer to economic feasibility. Maximizing the sport catch of artificially-produced coho, will also increase the benefit/cost ratio when compared to commercial harvest.

Approximately 2,000 adult coho were held in the holding pond at one time during September and October, 1975. In taking eggs and removing surplus fish from the holding pond, it was realized that this is near the maximum number that can be handled without mechanization or a labor intensive operation. Also a return of 2,000 adult coho to the facility would provide approximately 2,280,000 eggs (assuming 40% are females containing 2,850 eggs each). This is over twice the number of eggs expected to be required for facility restocking purposes. In considering the potential

of high handling mortality of eggs and poor egg survival, we should consider optimum female escapement to the facility to be 800 and total escapement to be 1,500 to 2,000 fish.

Using the jack return from 1972 brood coho as an indicator of subsequent adult returns, it is estimated that approximately 9,500 adult coho will return in 1976 from 100,583, 1973 brood coho smolts released. Considering a maximum desired escapement to the facility of 2,000 adults, the desired potential harvest will be approximately 7,500 fish. Through research and education of the fishing public, sport fishermen's use of these fish will be maximized. Even then the commercial troll fleet will probably catch greater numbers of artificially-produced coho than the sport fishermen.

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